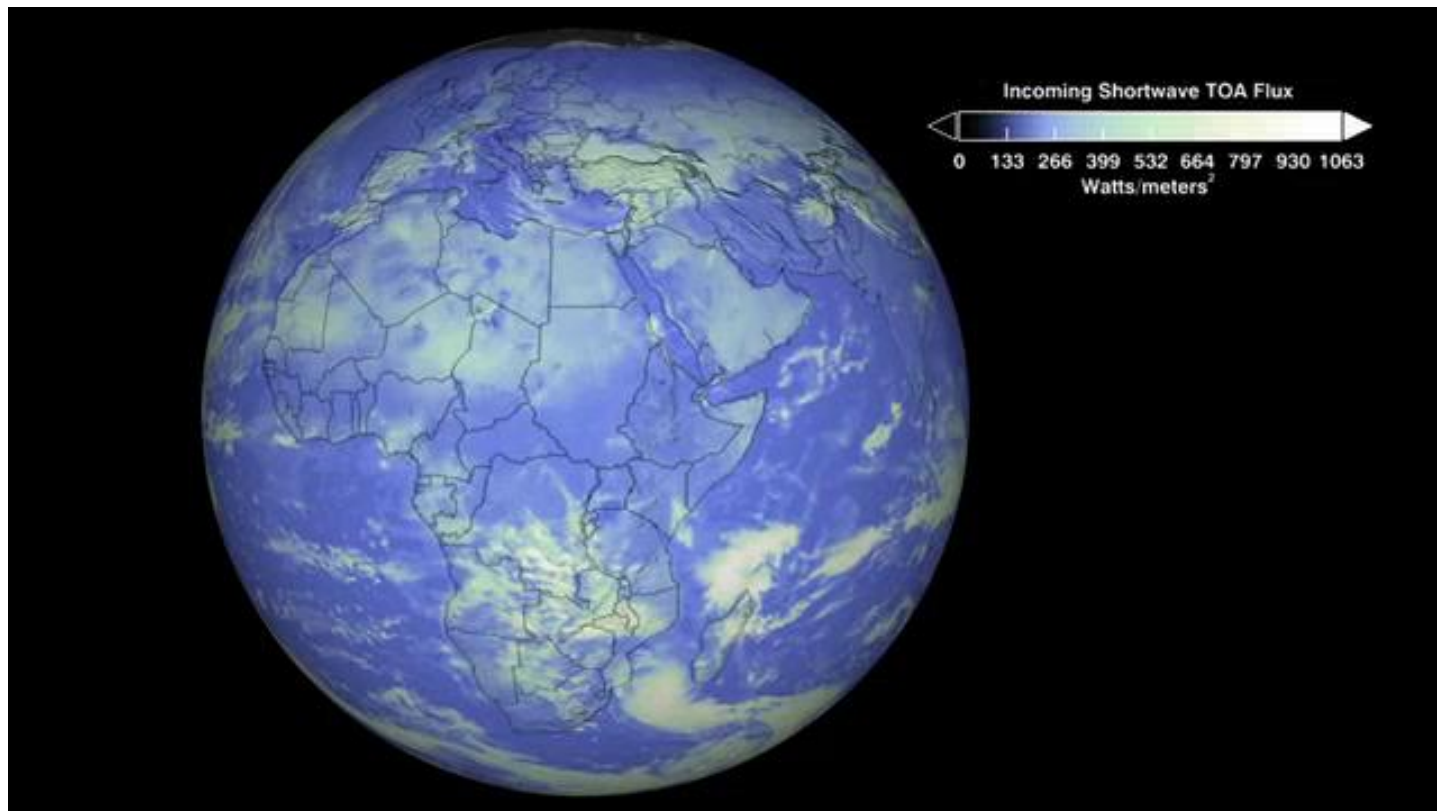


My NASA Data - Mini Lesson/Activity

Earth's Energy: Shortwave Radiation



Student Directions

Review the text and visualization below.

The Sun's radiant energy is the fuel that drives Earth's climate engine. The Earth-atmosphere system constantly adjusts to stay in balance. The balance is between incoming and outgoing energy. Incoming energy reaches the Earth from the Sun. Outgoing energy flows from Earth back out to space. This balance is called Earth's radiation budget.

Most energy received from the Sun is in the visible (or shortwave) part of the electromagnetic spectrum. Reflected Shortwave radiation refers to the total of all the shortwave electromagnetic energy, or sunlight at wavelengths ranging from 0.3 to 5 micrometers, that escapes from the top of the Earth's atmosphere back into space.

About 30% of the incoming solar energy is reflected. It is reflected back to space by clouds and aerosols or bright surfaces. The ratio of reflected-to-incoming energy is called "albedo". This is from the Latin word meaning whiteness.

<https://www.youtube.com/watch?v=WGbenwzZg7s>



Reflected shortwave flux at the top-of- atmosphere color bar for Suomi NPP CERES

This global view shows CERES top-of-atmosphere (TOA) shortwave radiation from January 26 and 27, 2012. Light energy reflected from Earth is shown in shades of blue and white. The unit is in Watts per square meter. The brightest-white areas are generally clouds. These areas are reflecting the most energy out to space. The darker blues areas reflect much less. Increasing cloud cover and snow/ice cover all tend to increase the ability of Earth to reflect energy out to space.

For more information on the Clouds and Earth's Radiant Energy System (CERES) see <http://ceres.larc.nasa.gov>.

Credit: NASA Scientific Visualization Studio

Steps

1. Review the text and the [Shortwave Radiation \(2012\) video](#) above and answer the questions. (Check with your instructor on how to submit your answers)
 1. What is albedo?
 2. What colors represent areas where the most shortwave radiation is being reflected back out to space?
 3. What are the units of these measurements?
 4. What drives Earth's climate engine?
 5. What system of the Earth system is constantly adjusting to maintain a balance between the energy that reaches the Earth from the Sun and the energy that flows from the Earth back out to space?
 6. What parts of the aforementioned system reflect energy back to space?
 7. What feedback do you predict if Earth's cloud cover decreases over time?

Teachers, these mini lessons/student activities are perfect "warm up" tasks that can be used as a hook, bell ringer, exit slip, etc. They take less than a class period to complete. Learn more on the "[My NASA Data What are Mini Lessons?](#)" page.

Teachers who are interested in receiving the answer key, please complete the [Teacher Key Request and Verification Form](#). We verify that requestors are teachers prior to sending access to the answer keys as we've had many students try to pass as teachers to gain access.

Access and Explore Data

- [Monthly Flow of Energy into Surface by Shortwave Radiation \(Watts per square me...](#)